

## **CHAPTER 5**

# **FIELD EXPEDIENTS**

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**An expedient measure is any method by which a task is accomplished using materials that are on hand. For example, vehicles may be required to operate in remote areas where assistance is not readily available. Under these conditions, the driver or crew must attempt self-recovery by using methods like those described previously in this chapter.**

**In addition, the crew can perform makeshift repairs on a mechanically disabled vehicle using field expedients, described later. Even crew members with limited mechanical training can apply expedient repairs with enough accuracy to restore at least partial operation to a disabled vehicle. However, expedient repairs are to be used as a last resort in emergency situations only. They must never be used in lieu of normal maintenance repair procedures. Permanent repairs should be made as soon as possible.**

# RECOVERY EXPEDIENTS

## PRY BAR

A pole can be used to pry a lightweight truck out of a ditch. Lift the front end of the truck with the pole. Apply power to the truck in reverse gear.

## SUBSTITUTE JACK TO REMOVE FRONT AND REAR WHEELS

To raise the front wheel of a cargo truck, secure a timber about 5-feet long to the front bumper at an



Figure 5-1. Pole Used as a Pry

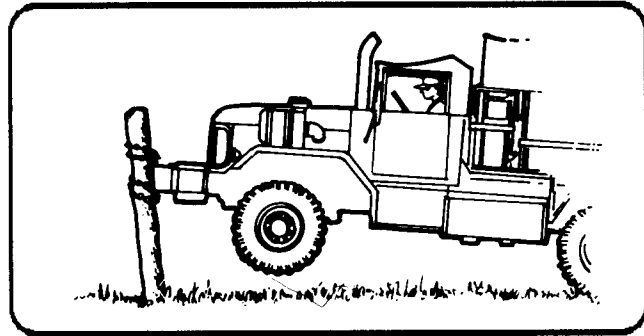


Figure 5-2. Jack Substitute (Front Wheels)

angle with a chain or rope. Place the bottom of the timber in a shallow hole. Move the vehicle forward until the timber is in a vertical position and the wheel clears the ground. Set the brakes and chock the wheels.

When an outside rear dual tire is flat and a jack is not available, run the inside dual wheel up on a small log or rock. This takes the weight from the outside wheel which can then be removed for replacement.

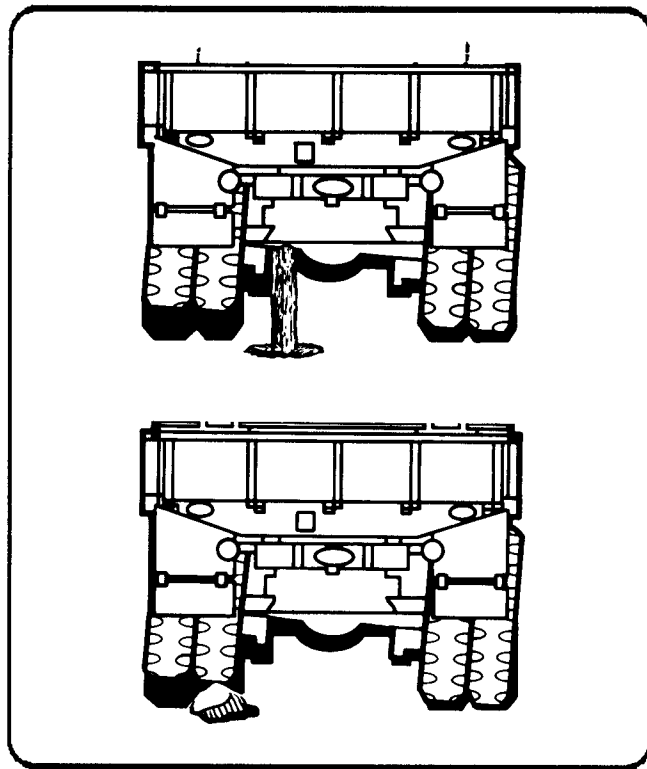


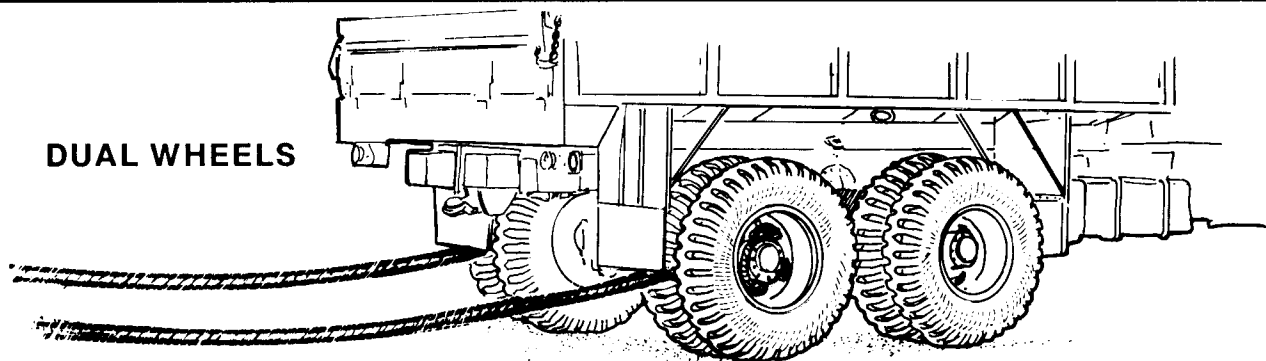
Figure 5-3. Jack Substitute (Tandem Wheels)

Another substitute for a jack is a piece of timber which is longer than the distance from the axle to the ground. Place one end of the timber against the axle at an angle and the other end in a shallow hole. Drive the vehicle onto the timber. Set the brakes and block the vehicle securely.

### DUAL WHEEL WINCHING

On dual-wheel vehicles not equipped with a winch, use the rear wheels to aid in recovery. Fasten one end of the rope to the wheel hub and anchor the other end. Run the end of the rope fastened to the wheel's hub between the duals and through one of the holes in the wheel disk. Take care not to place the rope through a hole in the wheel disk where the valve stem is located. Tie a knot in the end of the rope and slip over the hub. Tie a second rope in the same way to the dual wheels on the other end of the axle. Place the vehicle in reverse gear. The ropes will wind between the two duals and cause the vehicle to move rearward.

**DUAL WHEELS**



**SINGLE WHEEL**

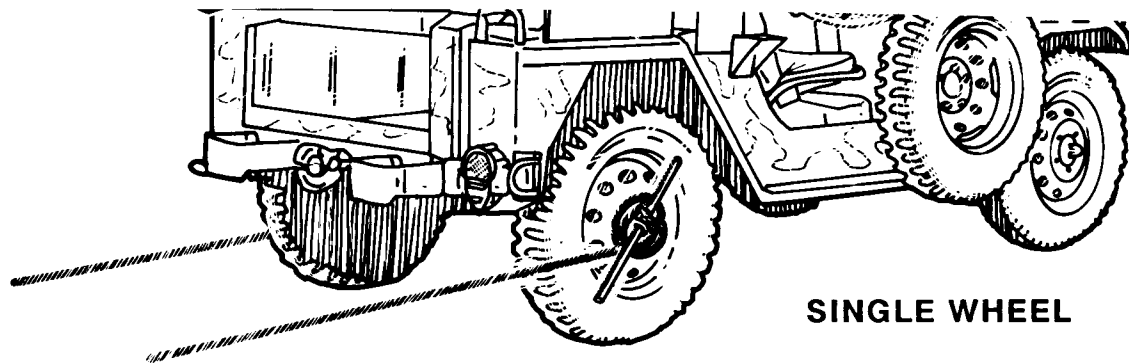


Figure 5-4. Wheels Used as Winches

## **SINGLE-WHEEL WINCHING**

If the truck has single wheels, place a bar through the hole in the end of the axle flange. Attach a rope to the wheels on each side of the vehicle by fastening them to the bars with figure-eight hitches. Apply pressure to wind the ropes around the hubs and move the vehicle.

## **USING AN A-FRAME**

Frequently, a truck will become nosed in a shell hole or narrow ditch where both lifting and pulling forces are required to make the recovery. If the nosed truck is equipped with a winch, use the winch to supply the pulling force and an A-frame for the lifting force.

To build an A-frame, use two long poles. Lash the poles together at the top by a figure-eight or girth hitch. Place the lower end of the poles in the ground 10-12 inches deep to prevent them from sliding when power is applied. Then lay the upper end of the A-frame against the front of the vehicle. Attach the A-frame.

**A NOSED TRUCK'S WINCH AND  
AN A-FRAME CAN SUPPLY THE  
LIFTING AND PULLING FORCES  
NEEDED TO RECOVER  
THE TRUCK**

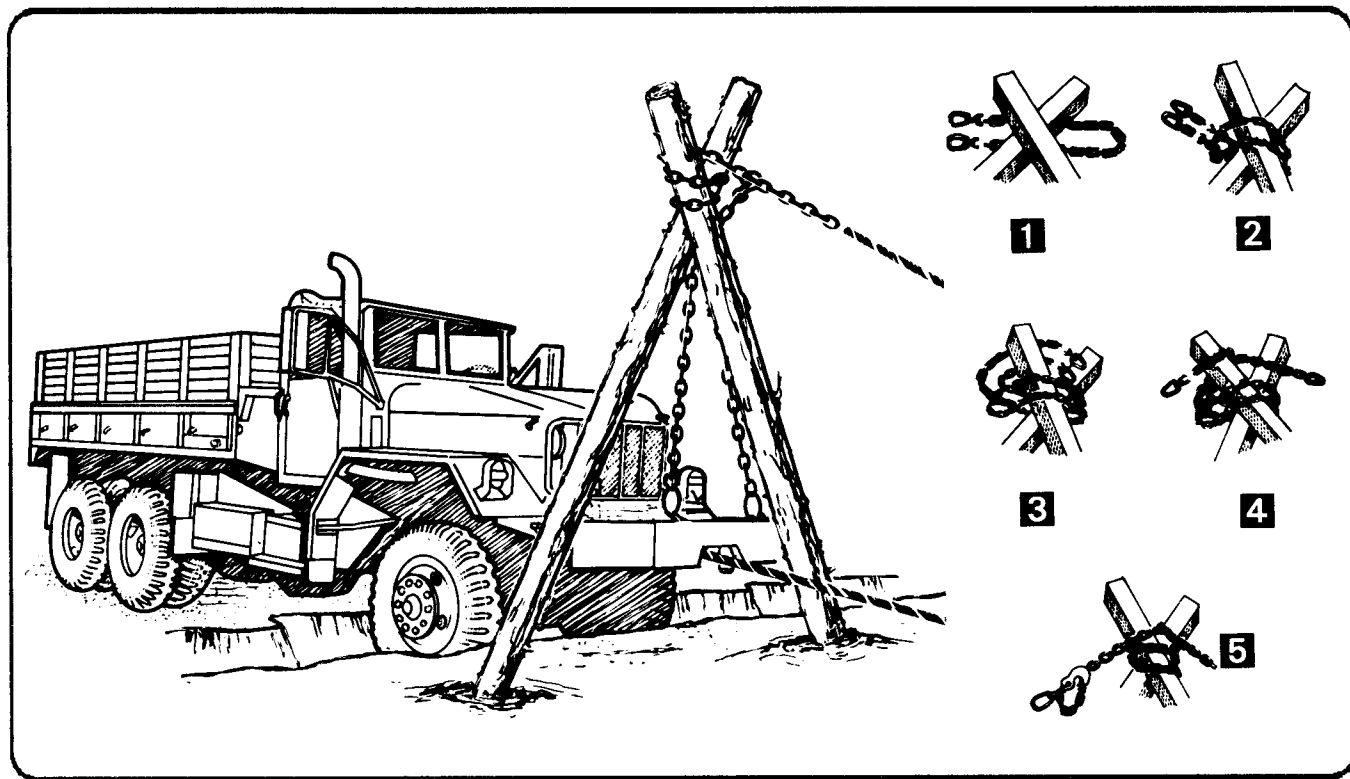


Figure 5-5. Girth Hitch and Use of an A-Frame in Recovery Operation

Rig the winch cable for a 2:1 mechanical advantage. Secure the end of the cable to the apex of the A-frame.

As the winch is wound in, the A-frame lifts and pulls the truck forward. Suspend the truck over the ditch or hole. Then fill the ditch with rocks, dirt, or other material so that the vehicle can be driven forward or backward.

## ANCHORING TRACKS

Vehicles often become bellied (high-centered) on stumps, rocks, dry ridges, or mire, and are immobilized by lack of traction.

To recover a bellied vehicle, obtain a log long enough to span the width of the vehicle and of sufficient diameter to support the vehicle weight. Place

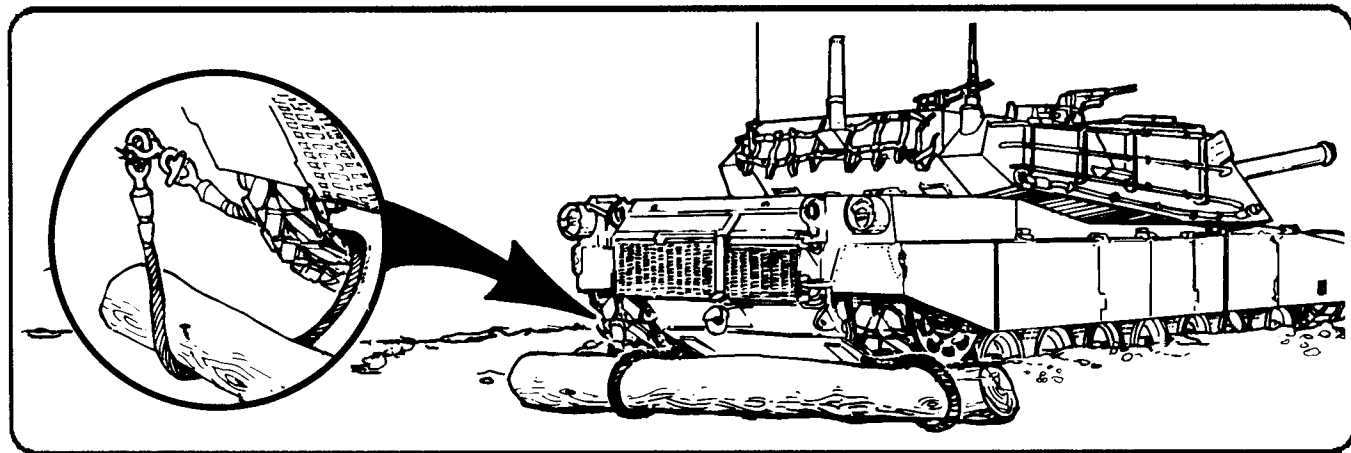


Figure 5-6. Log Used to Anchor Tracks

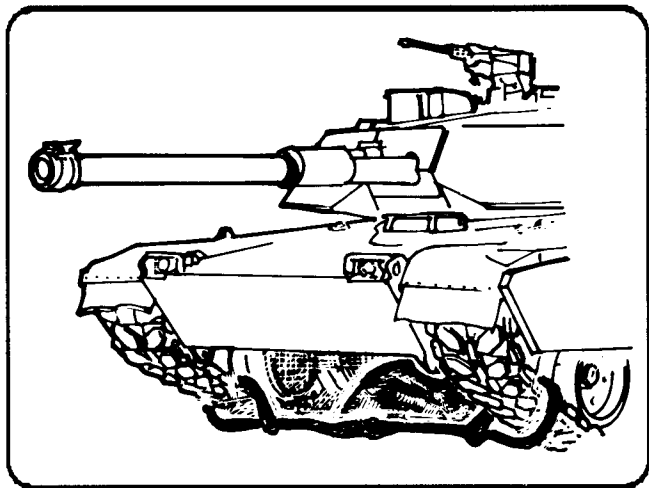


Figure 5-7. Cables Used to Anchor Tracks

the log against both tracks. Place a tow cable so that one end of the cable goes over the log and through the tracks from the inside. Place the other end of the tow cable underneath the log and connect the ends of the cable together with a tow hook on the outside of the track to make disconnecting easier.

Follow the same procedure to attach the log to the track on the opposite side of the vehicle. Take up the slack in the tow cable by gradually applying power to the tracks. This pulls the log underneath the tracks until it comes in contact with the obstacle, anchors the tracks, and causes the vehicle to move.

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**CAUTION:**

*To prevent damage to the fenders and tow cables, stop the vehicle before the log reaches the fenders or the cable reaches the drive sprocket.*

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For a bellied disablement other than mire, anchor the tracks by using two tow cables. Connect the tow cables together with a tow hook and attach the cables to both tracks by passing the ends of the cables through the tracks from the outside and attaching them to the standing parts of the cables with tow hooks. When power is applied to the tracks, the cable will contact the obstacle and anchor the tracks.



## MOVING A VEHICLE WITH BOTH TRACKS BROKEN

When both tracks are thrown, they may need to be separated before the vehicle can be moved to remount the tracks. Break one track and attach a cable from the drive sprocket hub to an anchor. This will support the vehicle so that the other track can be separated. Chock the vehicle to keep it from rolling out of control. Apply engine and steering power to

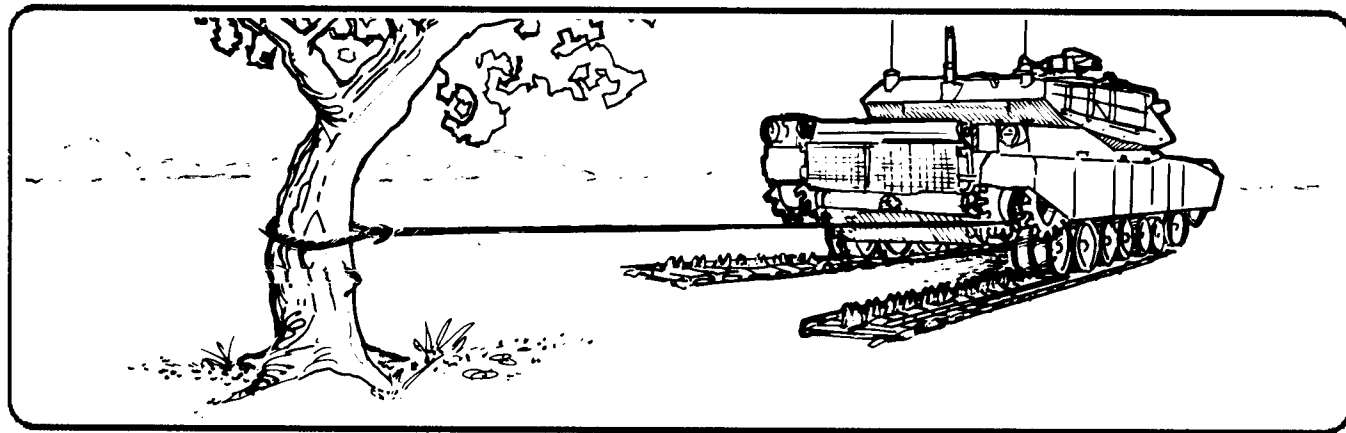


Figure 5-8. Moving a Vehicle with Both Tracks Broken

**A PLANK SERVING AS A RAMP  
CAN BE USED TO MOVE A  
VEHICLE ONTO A TRACK**

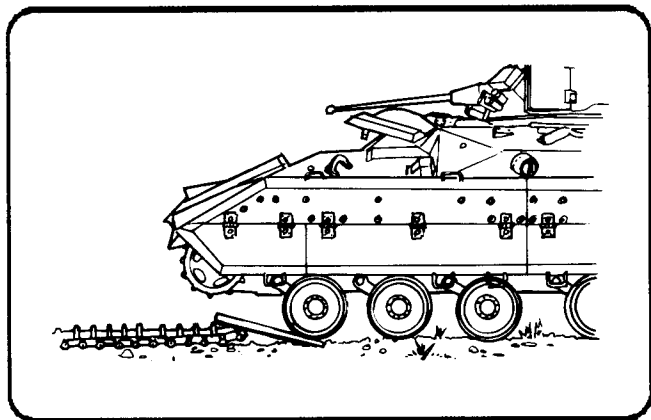


Figure 5-9. Moving a Vehicle onto a Track

the drive sprocket attached to the cable. When this is done, the vehicle will move by the winching action of the drive sprocket hub.

**MOVING A VEHICLE ONTO A TRACK**

Align the vehicle with the track and position a plank-type ramp on the end of the track. When a ramp is not available, dig a shallow ditch in which the end of the track can lie.

## **INSTALLING A TRACK**

Align the track with the road wheels so the center guides will pass between the road wheels when the vehicle is moved. Stop the vehicle so that the rear road wheel is resting forward far enough for all the track to pass over the sprocket.

Tie a rope to the center of the track pin on the rear track link. Pass the rope over the center guide groove of the sprocket hub, around and between the rear support roller wheels, and back around the sprocket hub, making two turns.

As power is applied to the sprocket, and the free end of the rope is held taut, the end of the track is pulled up to the sprocket. Once the sprocket has engaged a minimum of three track links, stop the sprocket, lock the brakes, and shut off the vehicle's engine. Remove the rope from the sprocket hub and extend it forward over the compensating idler wheel. Then, restart the vehicle and move forward. When the end of the track has passed over the compensating idler, connect the track.

**AS POWER IS APPLIED TO THE SPROCKET, AND THE FREE END OF THE ROPE IS HELD TAUT, THE END OF THE TRACK IS PULLED UP TO THE SPROCKET**

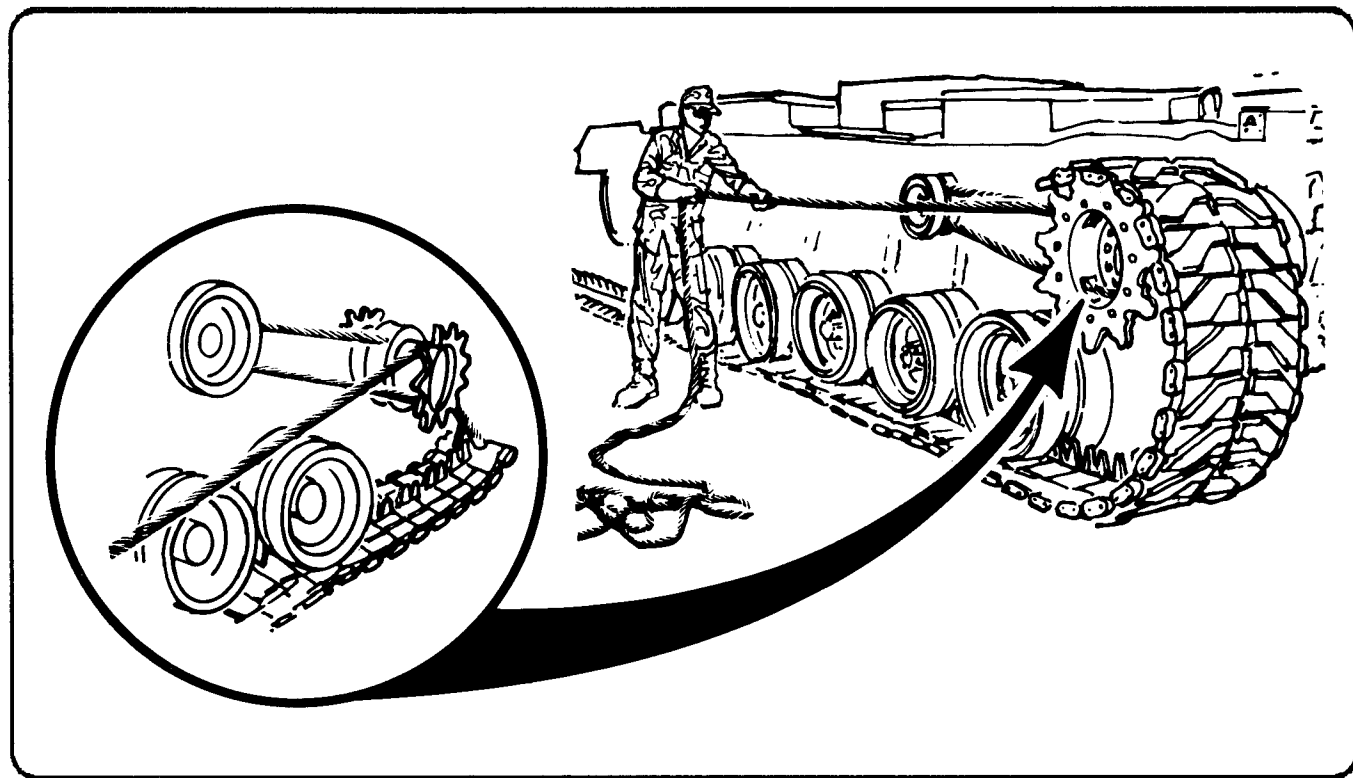


Figure 5-10. Installing a Track

## EXPEDIENT REPAIRS

### DEFECTIVE TANDEM AXLE

A tandem axle with a burned-out bearing or damaged wheel can disable a vehicle or cause further damage if operation continues. Move the wheel of the disabled axle onto a rock, log, or similar object, to raise the wheel as high as possible.

While the wheel is raised, tie the axle as tightly as possible to the frame by using heavy wire or a tow chain. Do not let the chain or wire cause damage to the brake lines. If the wheel bearing is burned out, or for some other reason the wheel does not turn, remove the axle shaft from the axle housing. Stuff the

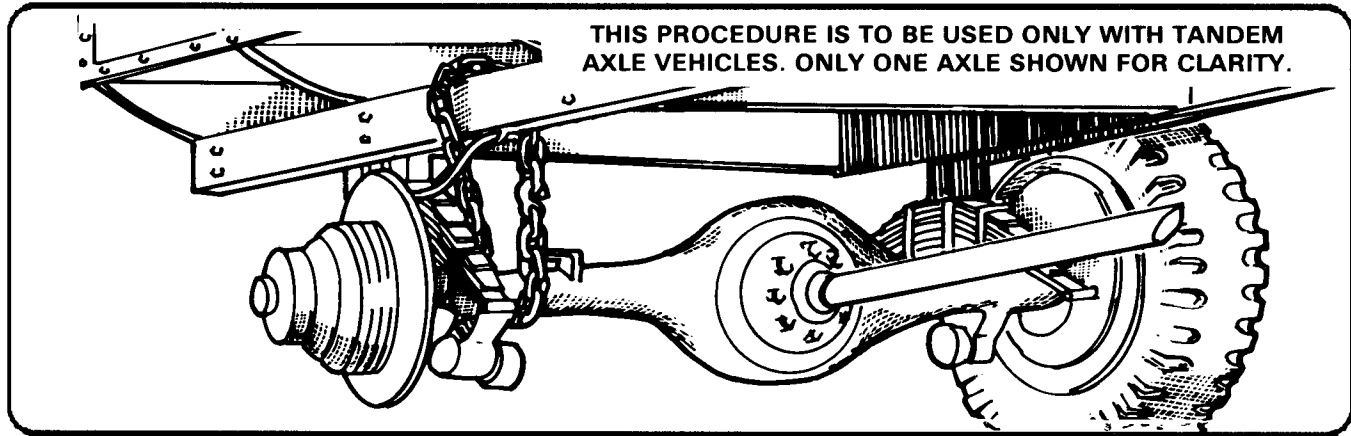


Figure 5-11. Attaching Tandem Axle to Frame

hole in the hub with rags to keep out foreign matter. This expedient method allows the other wheels to drive.

Use the same technique on both ends of the axle if both wheels are defective. Since both ends of the axle are tied up, do not load the vehicle too heavily.

### DEFECTIVE DIFFERENTIAL

If the defect is in the differential of a 4x4, 6x6, or 8x8 vehicle, remove the propeller shaft and drive axles. For example, if the front rear differential is defective and the rear propeller shaft is removed, the vehicle can still be powered by the front wheels. When the axle shafts are removed, cover the openings securely to keep out dirt and foreign matter.

### LOOSE BATTERY CLAMP

When a battery cable clamp becomes loose and cannot be tightened, use a nail or wedge to make contact between the battery post and the battery clamp. Loosen the clamp, insert the wedge between the battery post, and tighten the clamp.

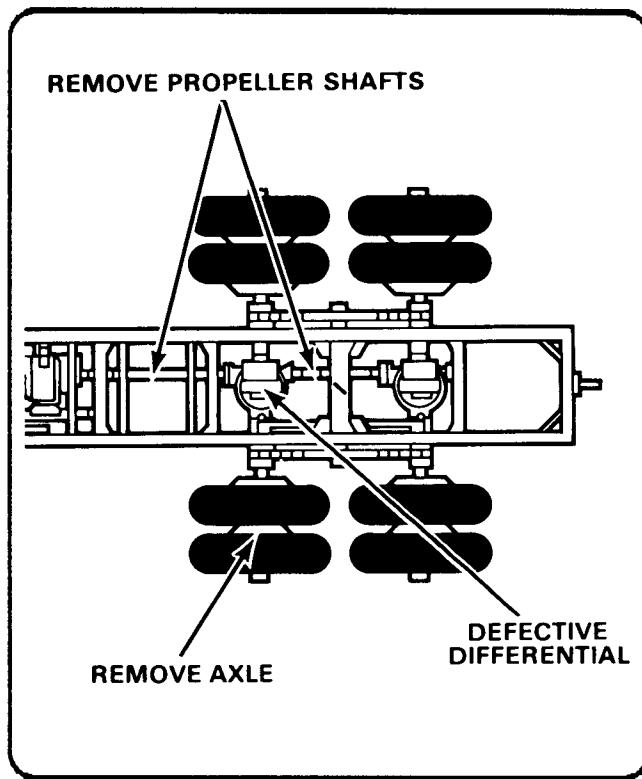


Figure 5-12. Defective Differential

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**WARNING:**

When working around batteries and battery clamps, take care to prevent tools and jewelry from arcing. This could cause damage to vehicle electrical components and personnel injury. **DO NOT** smoke or permit an open flame near the batteries since the gas from battery acid is explosive.

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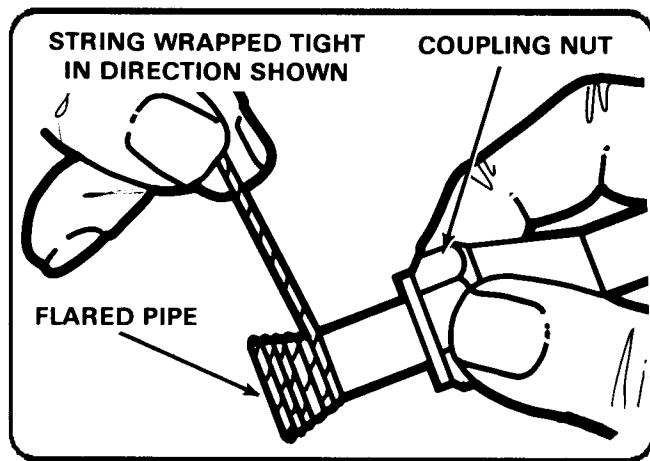


Figure 5-13. Low Pressure Line Fitting Repair

## **LEAKING LOW-PRESSURE LINE FITTING**

To repair a leaking low-pressure line fitting, wind a string or rag tightly around the line behind the flare. Wind the string clockwise in the same direction the coupling nut is turned to be tightened. Slide the coupling nut over the material, screw it onto its connection, and tighten it securely against the packing string with a wrench. The string will act as a gasket and seal the leak.

## **CRACKED LOW-PRESSURE OIL OR FUEL LINES**

Cracked low-pressure oil or fuel lines usually are caused from vibration or defective metal. If this occurs, stop the leak by wrapping the line tightly with friction tape held in place by wire. The wire helps the tape withstand pressure and usually stops the leak until a permanent repair can be made.

## **COLLAPSED FLEXIBLE FUEL LINE**

Make a support for the inside of the fuel line by wrapping a thin welding rod or wire around a pencil

or another object slightly smaller than the flexible line inside diameter. Place the coiled rod or wire into the flexible line. Fuel will be able to flow and the fuel line will not collapse.

### **REPAIR OF A PUNCTURED FUEL TANK**

Use a piece of hose about the size of the punctured hole in the fuel tank, a bolt, nut, and two flat washers. Assemble the washers and hose on the bolt and screw the nut down snugly. Enlarge the hole in the fuel tank, if necessary, so that the assembled bolt and hose passes into it and fits snugly. Hold the hose to prevent its turning and tighten down the bolt. This causes the piece of hose to expand in the hole and seal the leak.

### **LEAKING RADIATOR OR HEATER HOSES**

To repair a leaking radiator or heater hose, allow the engine to cool so that the hoses can be safely handled. Patch the leak by wrapping it with standard issue electrical or reinforcing tape. Refill the radiator with coolant and leave the radiator cap

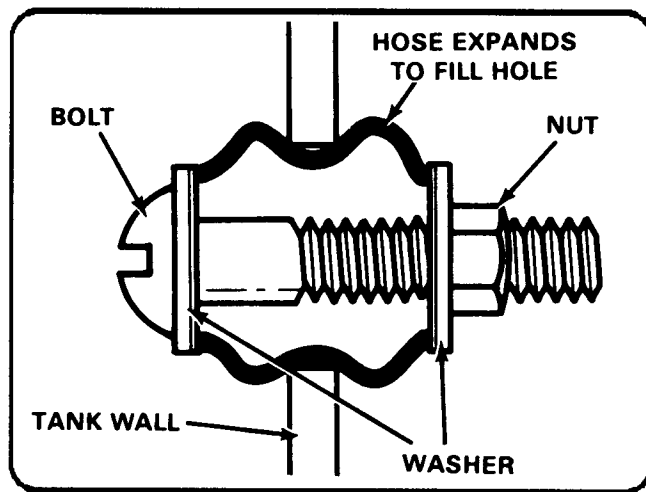


Figure 5-14. Fuel Tank Repair

loosened. Operate the vehicle at a reduced speed until the hose can be replaced.

### **PUNCTURED TUBE-TYPE RADIATOR CORE**

Radiators are often punctured when vehicles are operating in wooded or combat areas. When this



happens, cut the cooling fins and push them away from the leaking tubes. Cut the leaking tube in half and fold the ends of the tube back about three-fourths of an inch. Close the tube ends by pressing them flat with pliers. Cooling system efficiency is reduced when several tubes are cut, causing the engine to overheat. When field expedient repairs on the radiators are made, loosen the radiator cap. This

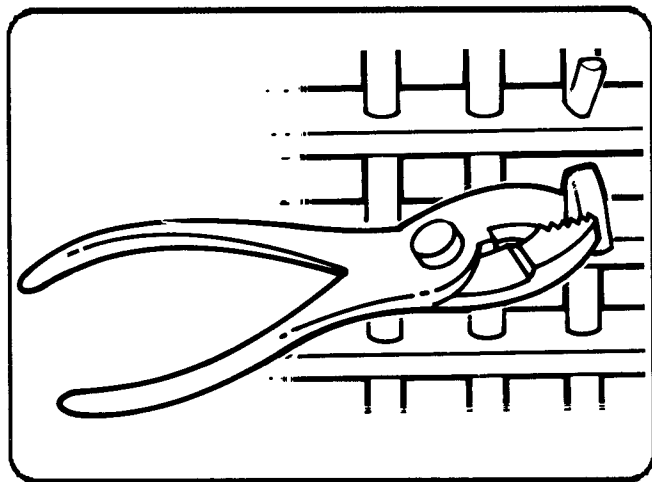


Figure 5-15. Radiator Repair

keeps the radiator pressure from building up and breaking the repair.

### **BROKEN FAN BELT**

When a fan belt breaks and a replacement is not available, mend or substitute it. To mend, punch holes in both ends of the broken belt and put a small gage wire or boot lace through each hole. Secure the wire or laces. Replace the belt with just enough tension to drive the vehicle accessories.

Use fiber rope from the vehicle tarpaulin or a piece of field telephone wire as a substitute for the broken fan belt. Loop the wire or rope around the pulleys several times, pull as taut as possible, and tie with a square knot.

In both cases, operate the engine at low speed to keep from losing or breaking the substitute belt.

### **BROKEN FAN BLADES**

A broken fan blade will cause the engine to vibrate and make it dangerous to operate. On fans with an equal number of blades equally spaced, remove the

remainder of the broken blade, and then remove the blade opposite the removed blade. The vehicle can then be operated, but be careful that it does not overheat. On fans with unequally spaced blades, the entire fan can be operated under the light load for short periods of time.

## **DAMAGED FRONT AXLE BRAKE SYSTEM**

When damage has occurred to the front axle brake system, close the line at the junction block to the axle. This assists the driver in maintaining steering control while braking and allows pressure buildup in the rear brakes.

## **DAMAGED ROAD WHEEL COMPONENTS**

**NOTE:** The following damaged road wheel expedients do not apply to the M1.

To operate a vehicle with a damaged road wheel, spindle, or road-wheel arm, tie the arm up out of the way. To tie the road-wheel arm up, remove the torsion bar by positioning the vehicle across a ditch. It

should be narrow enough to permit the front and rear road wheels to support the weight of the vehicle and deep enough to permit the track to sag away from the defective road wheel.

If a ditch is not available, dig a trench. This allows the road-wheel assembly to sag and removes the tension from the torsion bar. Then remove the torsion

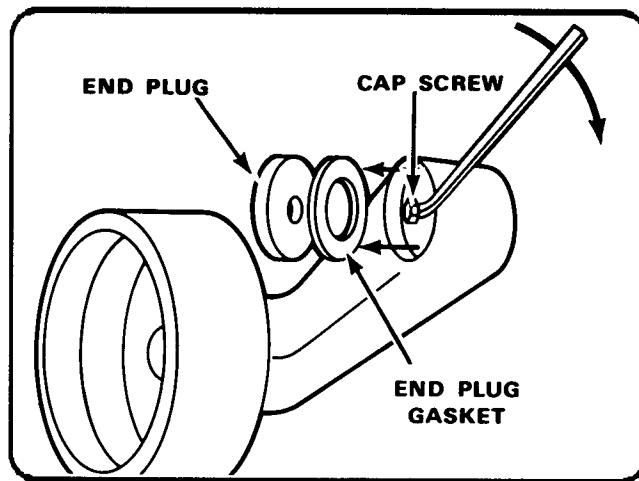


Figure 5-16. Torsion Bar Removal

bar by removing its cap screw and end plug, replacing the cap screw in the torsion bar, and prying behind the cap screw head with a tanker's crowbar.

Reposition the vehicle on level ground. Remove the road wheel: position a tanker's crowbar across two torsion bar support housings and, using a rope from the vehicle tarpaulin, tie the road-wheel arm to

the tanker's crowbar. Use this expedient method with intermediate road wheels only.

## **DAMAGED SUSPENSION COMPONENTS**

To give the vehicle better stability, move the number 3 road wheel (with arm) to the rear road wheel position as in the example shown. Due to the absence

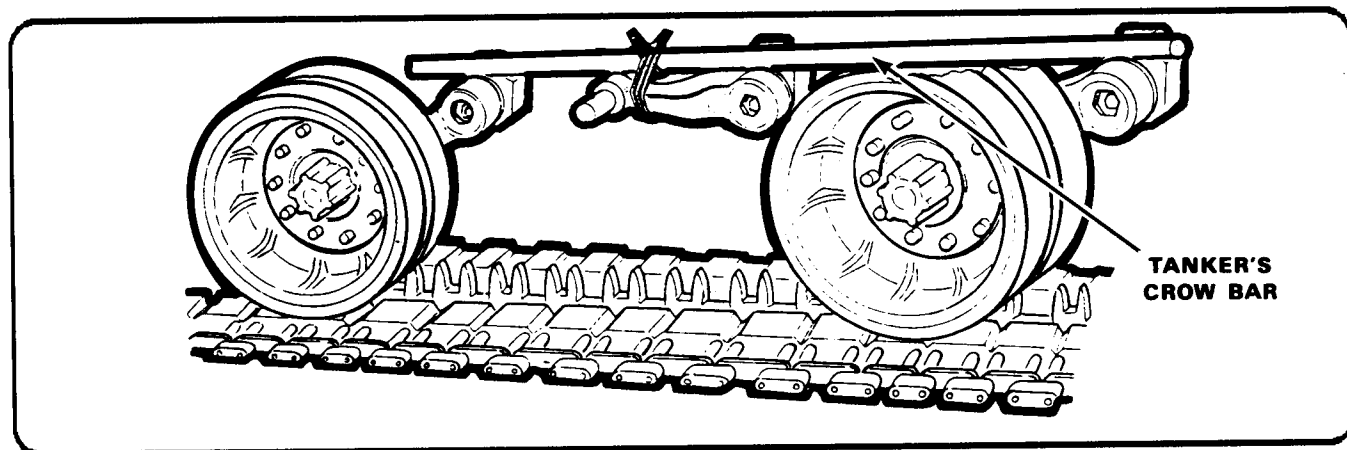


Figure 5-17. Road Wheel Expedient Technique

of the idler wheel, sufficient track blocks must be removed to permit the track to be connected.

A track vehicle with a damaged track, rear road-wheel arm, or idler wheel can be operated by using the short track expedient method. However, the hull must not interfere with the shortened track as with

M60-series tanks. To apply this expedient, remove the companion components to the damaged suspension parts, such as the rear shock absorber, track adjuster, road-wheel arm, and torsion bar. Before applying short track expedient methods on M1-series vehicles, you must check procedures outlined in TM 9-2350-255-BD.

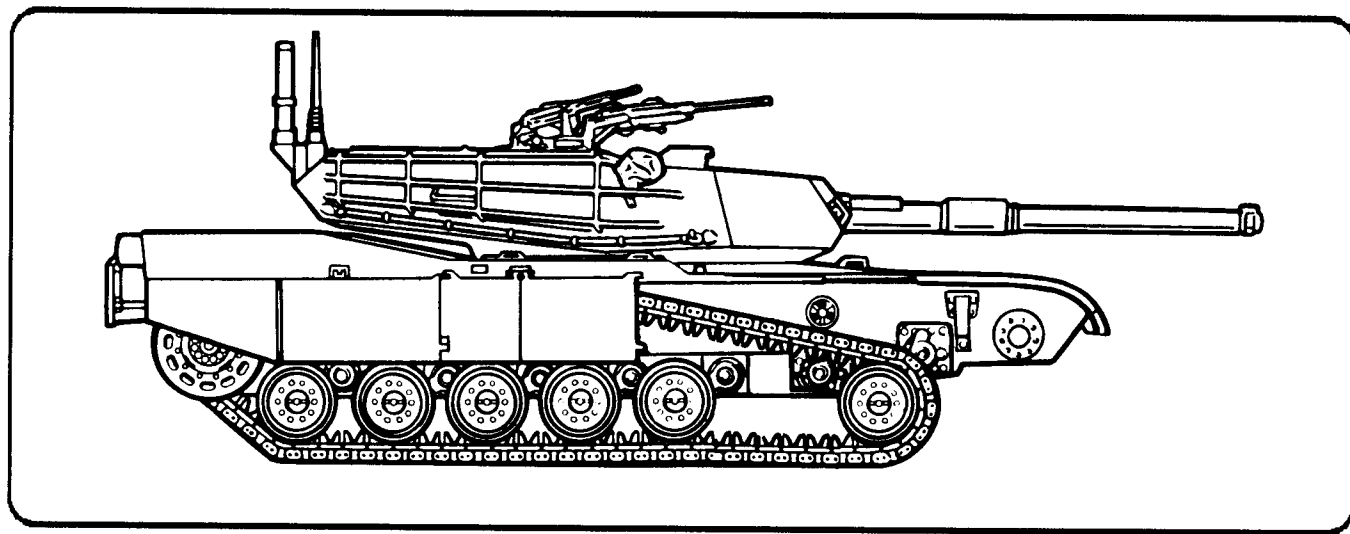


Figure 5-18. Short Track Expedient Technique

## SHEAR PIN SUBSTITUTE

Make a substitute for a broken shear pin by punching out the remains of the broken shear pin, cutting the remains in half, and inserting the two shear pin halves with a short, wooden dowel between them. Wrap friction tape around the shaft to cover the shear pin hole and prevent the end of the substitute shear pin from dropping out. Do not use a steel bolt, spike, nail, or screwdriver blade as a substitute shear pin because it could damage the winch and cable.

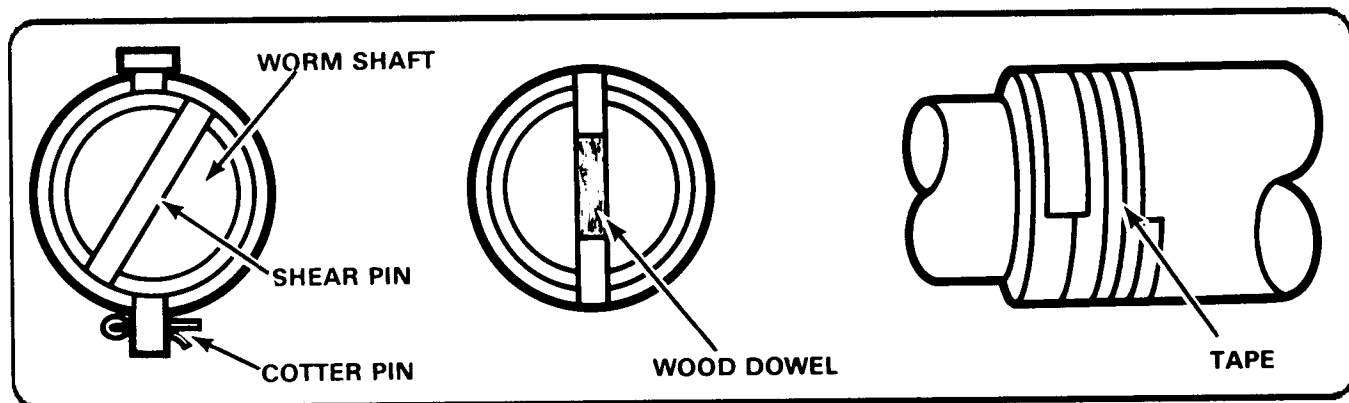


Figure 5-19. Shear Pin Substitute